FIRE MANAGEMENT

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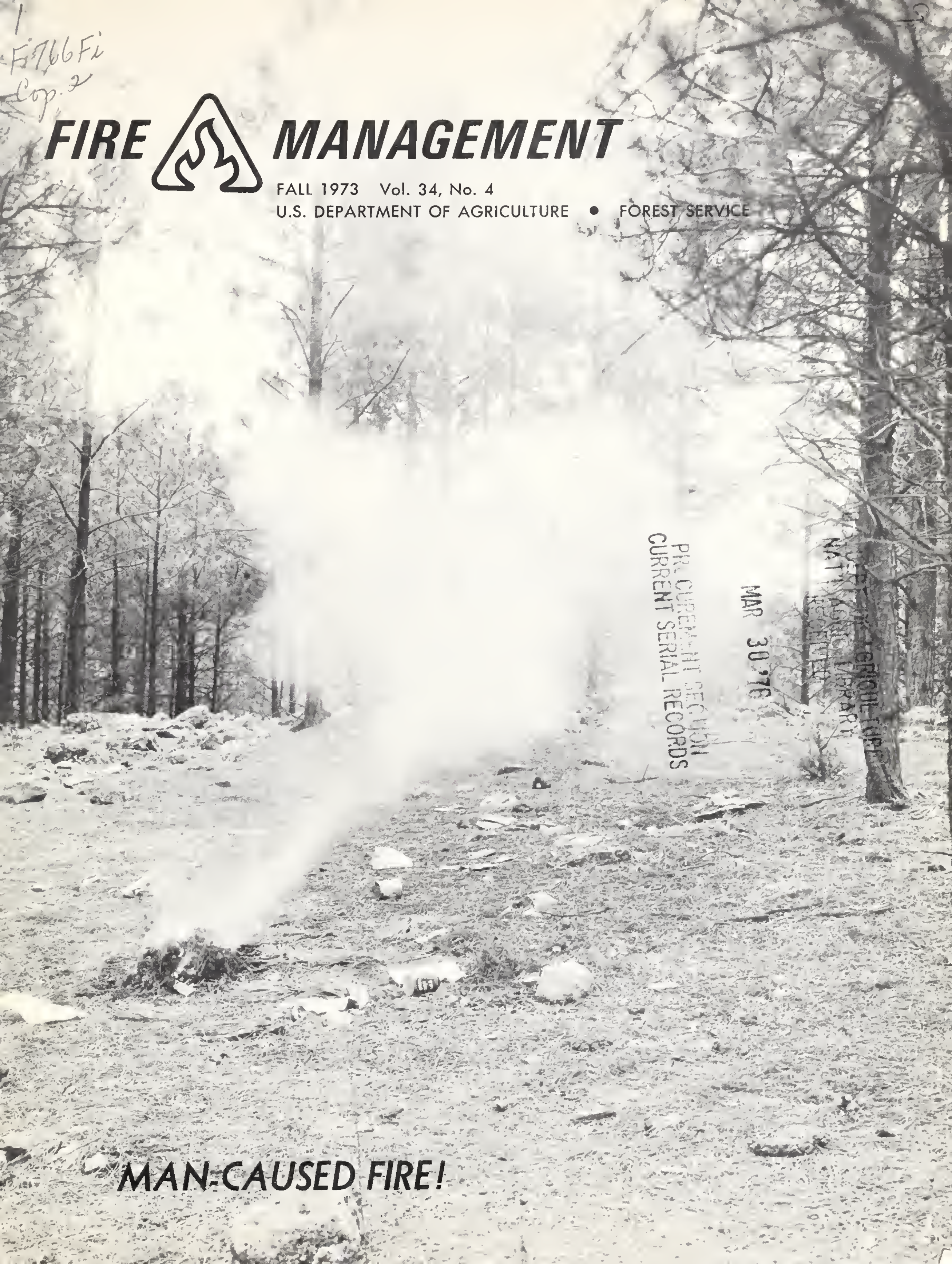

MAN-CAUSED FIRE!

FIRE MANAGEMENT

An international quarterly periodical devoted to forest fire management

A large number of the wildfires this season were man-caused. An analysis technique for determining the extent of this problem has been developed. See story, next page.

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Aiming Your Fire Prevention?

New Analysis Technique Helps Managers in Fight Against Man-caused Fires

Howard R. Koskella

How can efforts to prevent man-caused fires be aimed at providing the highest cost/benefit return?

By comparing man-caused fire activity severity and seasonal weather severity, managers can measure and determine their fire prevention management problem.

Chart 1 shows the man-caused (M-C) fire activity severity and each of its components—occurrence, acres burned, damage[1], and trend. By summarizing the data for each component as a single figure, forests with major M-C fire problems are easily identified. For example, the 10 Forests in this study account for 60 percent of the $9 million dollar average annual man-caused fire damage loss. These Forests also account for 50 percent or 73,965 acres of the annual man-caused fire acreage burned in the National Forest System.

Permits Realistic View

Taking the analysis one step further, M-C fire activity severity can be compared to seasonal weather severity and total M-C fire occurrence (Chart 2). This allows a real-

Analysis, p. 5.

Howard R. Koskella is a Staff Forester, Division of Fire Management, Washington Office, Forest Service, USDA.

[1] Acres burned and damages reflect suppression effectiveness. Refinements in this procedure to compensate for these effects will be proposed by the National Wildfire Prevention Analysis Task Force.

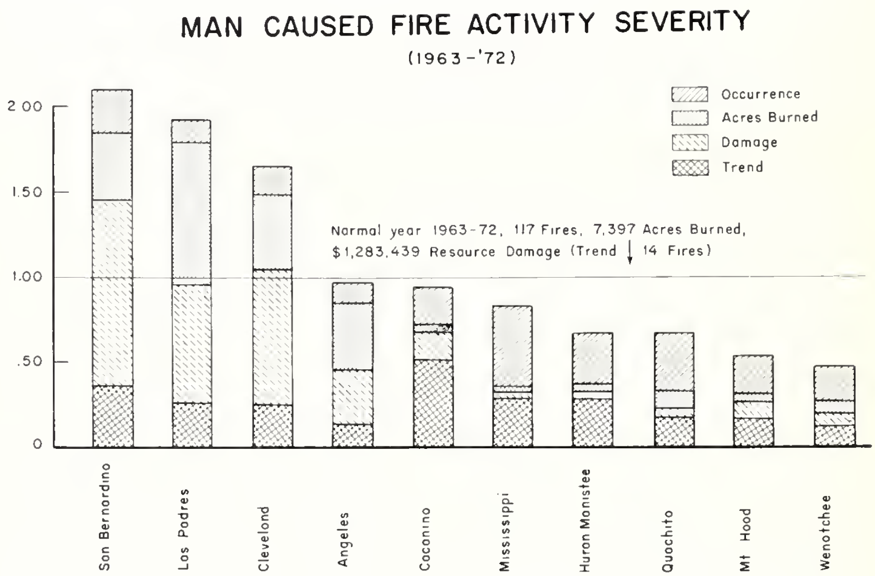


Chart 1. Shows the analysis of man-caused (M-C) fire activity severity which consists of occurrence, acres burned, damage and trend for 10 National Forests.

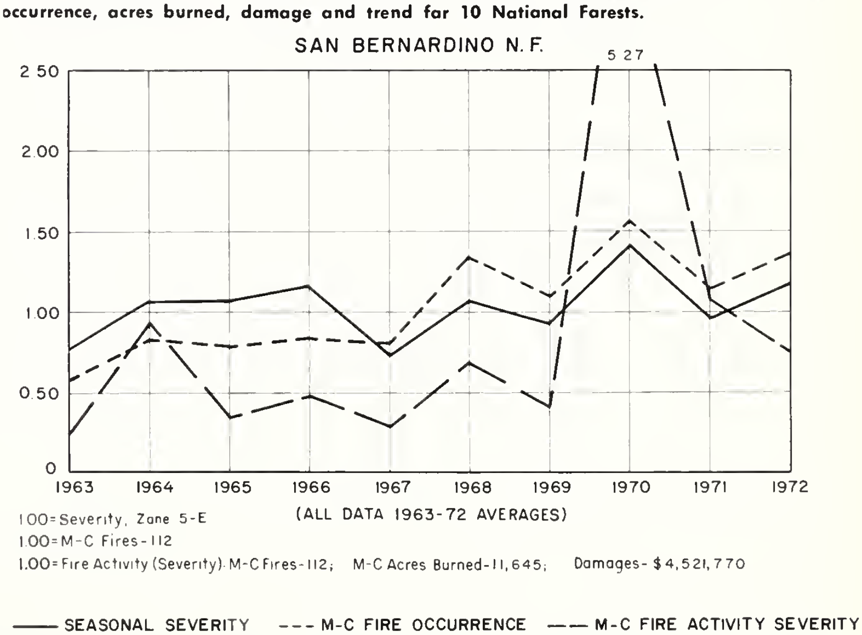
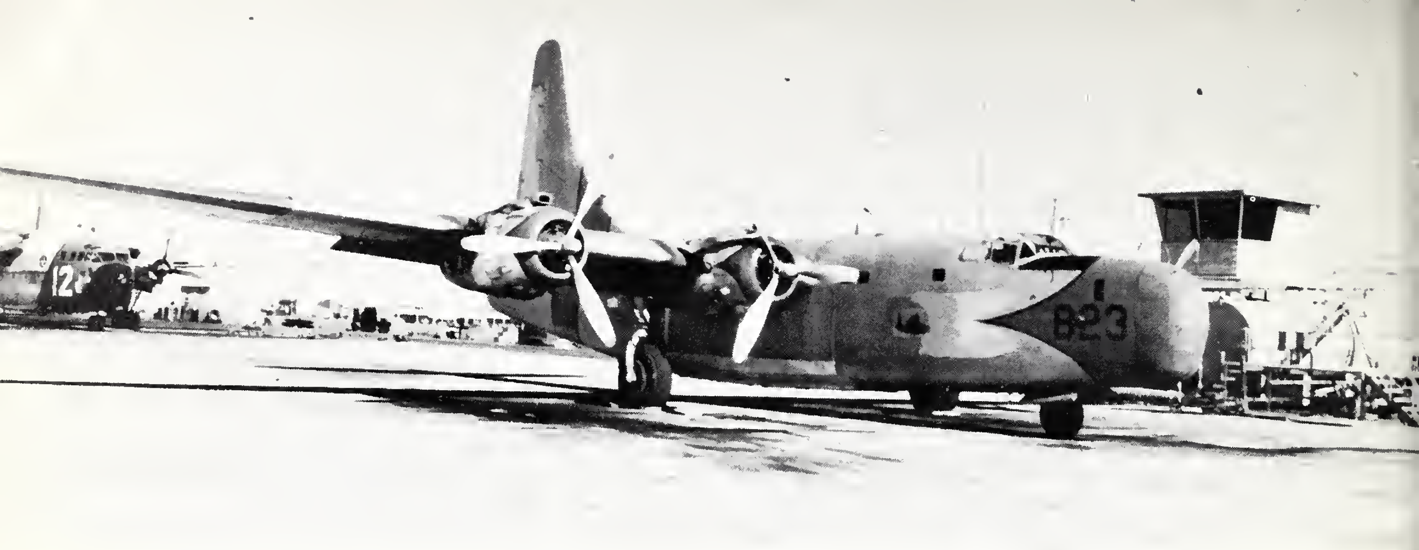


Chart 2. — Relationship of M-C fire activity to seasonal weather severity and M-C fire occurrence.



2,400-gallon capacity Super PB4Y2 in foreground with tanker base and C-119 in background.

Team Effort Makes Effective Base For Air Tankers

James D. McKay

The Air Tanker Base at Boise Interagency Fire Center, designed and built as a team effort by the Forest Service (FS) and Bureau of Land Management (BLM), is an effective fire retardant delivery facility. The base became fully operational in the summer of 1970 and is under the supervision of the Boise National Forest.

The old tanker base was started as an emergency setup in 1958, but it was moved several times and it grew as equipment was added. A 2-inch pipe running from a canal about a quarter mile away supplied water to the old base. Personnel were housed in surplus or rented trailers. Despite its drawbacks, the base performed well for many years.

The new base was designed and constructed by the FS and BLM to incorporate many good features of other air tanker bases throughout the country and to avoid the problems of the old Boise base and other bases.

James D. McKay is Fire Control Forester, Boise National Forest.

Agencies Planned Together

Electrical and water systems and the ramps were designed and built by the BLM. The FS designed and installed mixing, loading, and storage facilities. The agencies worked together in the planning phases, and all design requirements were incorporated into a master plan. The FS San Dimas Equipment Development Center reviewed the plan.

The base is composed of five principal elements: A hardstand for parking and loading aircraft, a pumping and loading system for slurry delivery to the aircraft, a retardant mixing and storage facility, office space for the air service manager, and a pilot readyroom.

Hardstand

The tanker base's reinforced concrete hardstand was designed by engineers from the BLM's Portland Service Center. It is 460 feet long and 160 feet wide and slopes gently to a concrete ditch which is 24 inches wide.

The ditch slopes in one direction to a valve system which allows all waste material to flow to either a buried 8,000-gallon holding tank or through an extensive but simple culvert system to the nearby desert. This allows easy control of storm runoff and containment of noxious elements of the slurry operations during the fire season.

The ditch also carries a 2-inch iron pipe for three water washdown stations and a 6-inch aluminum line used for slurry transfer to three aircraft loading stations. The entire ditch is covered with treated Douglas-fir heavy decking which allows it to be crossed by either vehicles or aircraft.

Embedded in the hardstand are three additional water stations for aircraft washdown plus electrical outlet boxes with 110-volt and 220-volt power for aircraft maintenance. All are mounted flush to the concrete.

Pumping System

The heart of the loading system is a 60-horsepower, 4-inch pump which draws slurry through 8-inch lines from the storage tanks and sends it down the ditch through the 6-inch pipe to any one of three loading stations. Each station is quick-connected with 50-feet of 3-inch hard rubber hose mounted on three-castered carts for attachment to the aircraft. Three aircraft can be loaded simultaneously. Loading rates vary with the number of aircraft being loaded and the loading stations used. During fire operations, delivery rates for loading aircraft exceed 600 gallons per minute, with an average time of just over 4 minutes for a 2,400 gallon air tanker.

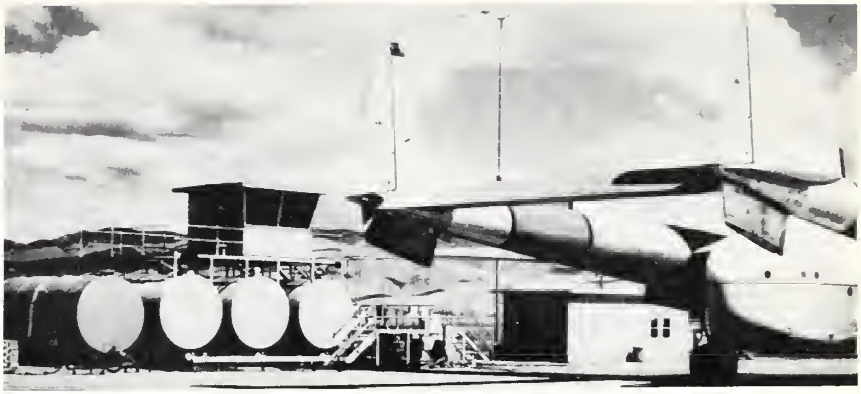
Mixing and Storage

The mixing facility consists of two high-shear 500-gallon batch mixers, one electric and one gasoline. Mixed retardant is pumped from the mixers to the waiting aircraft or to the storage tanks. Slurry is transferred to the tanks through 4-inch pipe.

The storage facility consists of three permanent 8,000 gallon tanks which are 8 feet in diameter and 20 feet long. The tanks are installed on their sides and raised 2 feet at the rear. This allows easier slurry flow to the 8-inch outlets supplying the loading pumps.

Slurry uniformity during storage is maintained by a perforated 4-inch pipe 19 feet long within each tank. All slurry passes through the perforated pipe during either transfer to the storage tanks or during recirculation. A fourth 8,000-gallon tank is used for additional storage, retardant testing, and crew training.

A 25-horsepower gasoline powered 4-inch pump is held in reserve for slurry transfer or aircraft loading in the event of electrical power failure. Water for the base is supplied through a 6-inch city water main at 60 pounds pressure.



2,400-gallon capacity C-119 air tanker stands ready at the center loading station. Tanker base is in background.

The office of the Air Tanker Base Manager is located above the tanks. This gives him a complete view of the mixing and loading operations and the airport itself. Radios and telephones provide communications with the dispatchers and aircraft. The office is 10 x 11 feet with solar glass on three sides. It is completely insulated and electrically heated and air conditioned. An air conditioned pilot readyroom is located adjacent to the mixing facility near one end of the hardstand.

Base Delivers Slurry

Normally, three air tankers are stationed at the base: two 2,400-gallon C-119's are contracted to the BLM and one 2,400-gallon Super PB4Y2 is contracted to the FS. The normal complement of base manpower is one air service manager and three tanker base personnel. During "bust" situations, personnel are increased to handle the overload situation.

Analysis, from p. 3

istic view of the overall fire prevention problem.

Chart 2 shows that man-caused fire activity and seasonal severity trends are interrelated. When seasonal severity is high (because of drought, light winds, etc.), factors are present that also increase the probability of man-caused fire starts.

When the trend of man-caused fire activity swings up sharply from seasonal severity trends, the increase in man-caused fires should be carefully analyzed.

Higher Cost/Benefit

Prevention efforts will have higher cost/benefit return if directed to those types of man-caused fires (debris burning, campfires, railroad fires, etc.) contributing the most to high fire activity severity. Without specific fire prevention emphasis, damage and losses can be expected to rise with the increase in fire activity severity.

The relationship of occurrence, M-C fire activity, and seasonal severity will reflect the success of specific elements of fire prevention management.

The first management failure may be reflected in high M-C occurrence by unrealistically high numbers of M-C fires.

The second management failure is reflected in excessive acreage loss due to M-C fire ignition in high flammability areas, usually a fuel problem.

The third management failure is often reflected in high damage resulting from unsuccessful initial attack.

The fourth and ultimate management failure is high resource loss when M-C fires escape pre-determined areas and threaten or destroy water, timber, structural, and human resources.

"Show and Tell" Technique Prevents Man-caused Fires

Marvin E. Newell

An appalling number of people simply do not know how to properly build, care for, and extinguish a fire. Not that people intend to start fires or do not want to put them out — many of them are just ignorant of the hazard and how to care for a fire.

This problem has been the major cause of fires within the Flaming Gorge National Recreation Area (NRA), Intermountain Region. It was the primary target selected by this Region for its 1972 fire planning project.

Marvin E. Newell is the Fire Management Branch Chief, Ashley National Forest, Intermountain Region.

The Flaming Gorge National Recreation Area, Ashley National Forest, was established in 1968 and includes roughly 200,000 acres of land in northeast Utah and southwest Wyoming. The Area reservoir, backed up by the 502-foot Flaming Gorge Dam extends through Red Canyon — a twisting, spectacular gorge on the Green River. Explorer John Wesley Powell named the Flaming Gorge section in 1869 on his way down the Green River.

Tourists are attracted to the exceptionally beautiful canyon, mountain, and desert scenery and a wide variety of land and water-based recreation activities. Recreation use has grown to 800,000 visitor days, and use is expected to continue to increase. Visitors come from all 50 States and about 40 foreign countries.

Man-caused Fires Increase

The prime concern on the Ashley is the marked potential for environmental havoc. On the average we can expect eight man-caused fires each season at Flaming Gorge, but occurrence has been mostly in or near high value lands with costly nearby developments. The man-caused fire

Flaming Gorge National Recreation Area.—Across the Green River are the scenic cliffs and the Uinta Mountains. Photo was taken from a point just north of the suspension bridge on the road between Greendale Junction and Dutch John.

trend increased significantly in the years immediately following development of the NRA. For the last several years man-caused fires have increased at a slower rate.

The largest fire since 1960 burned 85 acres; most fires have been confined to classes A & B by suppression efforts. However because of the length of fire season, fuel type, the normal burning index, and an increasing man-caused risk, the probability is high that eventually a fire will escape and result in significant damage to NRA land values and improvements.

On the basic premise that these fires are caused by ignorance of the hazard and how to care for fire, we are directing our main efforts toward educating the recreationist. We realize that (1) we can't do this alone, (2) we must not confine our efforts to the local population, and that (3) we must continue our efforts indefinitely.

Patrolmen Show and Tell

In addition to the traditional fire prevention methods of increased contacts, signing, use of news media, etc., we are using a "show and tell" approach that includes:

1. Having recreation and fire prevention patrolmen on the Ashley give demonstrations to people where and when they see a need. Rather than just telling the Forest user "to be careful with fire" or "put out your campfire," the patrolman stops to show people how this is done He asks questions to see if they have gained understanding, while emphasizing the need for proper equipment such as shovel, axe, and bucket.

2. Producing TV film for news programs and as public service specials. We contacted specialists in the Regional Office who have provided invaluable assistance, advice, and help in actually doing the filming.

In one film a family camp setting was used, with an employee's family, in the NRA. The "how to" and "how not to" was explained and demonstrated by the District Fire Staff Officer. A staged fire "getting away" and shots of the spectacular country serve as an initial attention-getter.

Hopefully, by getting the film used in news programs and as public service announcements on TV stations in the area surrounding the NRA, we are informing many thousands of Forest users througout the season.The news features are used several times during the fire season, thus reinforcing the fire prevention message and motivation.

3. Arranging with the one radio station serving the area to provide a localized daily weather forecast. Along with the weather, we include the fire-danger rating and a short personalized prevention message (fishermen during opening week, hunters during hunting season, etc.). This year we will provide, through the brief message, helpful hints on how to build, care for, and extinguish a "campfire."

Although these efforts require additional time and expense, we are sure they are paying off in fewer man-caused fires because of an enlightened public.

Southwest Region Expands Model-70 Tanker Fleet

"We have purchased nine units and plan additional purchases in fiscal year 1974" — action like this by the Forest Service Southwestern Region confirms the high performance ratings that users are giving the Model-70 ground tanker.

The Model-70 consists of a 600-gallon tank mounted on a 19,000 GVW unit that has a 60-inch cab-to-axle chassis. These short-coupled units with a large volume of water have proven to be versatile and highly effective units, the Region reports.

Uses Centrifugal Pump

A transmission power takeoff drives a Hale CPB-4 centrifugal pump. The pump has a varying performance up to 250 psi at 350 gpm. The Region's units are set at 200 gal/min at 150 psi. The unit also has the capbility of making a running attack with 100 psi at 4 m/h.

The tanker unit is equipped with right and left hose reels; right, left, and rear 1½-inch overboard dis-

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Ghosts of the Mountaintops Give Way to Airborne Detection

James R. Elms

The humble lookout and smoke-chaser of the Forest Service's early days would probably be startled by today's spotter planes, airborne infrared fire detection system, smoke-jumpers, giant fire retardant drop planes, and other innovations of the airplane age.

But, on the other hand, can you imagine a giant pine tree with a ladder propped up against it being used as a lookout tower? Or an alidade board on a stump wedged into the crevice of some point of rocks? Or a lookout platform attached to a large topped tree? With the development of airborne fire detection, these combinations of lookout tower and living quarters have become the ghosts of the mountaintops.

When a fire was spotted, the long, slow process of marching crews of firefighters and strings of supply-laden mules up to the fire began. By the time they got there, what might have been just a small spot fire could have erupted into a thousand-acre inferno.

This was the "golden era" of the lookouts which reached its zenith during the 1930's, about the time Major Kelly was Regional Forester in the Northern Region. At that time there were between 1,500 and 2,000 lookout towers in the Northern Region. Today only 132 are manned.

Take a look at some of the early towers.

Lookout Tree on Horse Butte Point, Gallatin NF (Old Madison Forest)

This tree was in use as a lookout tower until 1953. Up into this leaning 20-inch Douglas-fir, with lightning protection, climbed the Gallatin Forest dispatcher who was at the lookout in the 1930's (in a tent camp). Every couple of weeks he had to pack a 39-pound oak barrel down to a ranch for water about ¾ of a mile away. The water trip had two rest stops, each at Douglas-fir trees with forks that would hold the barrel.

Chewelash Mountain Lookout Tower, Colville National Forest

This lookout, completed about 1935, was the first on this site. Built by WPA, it was a 40-foot pole supported with poles for cross-bracing. The WPA crew worked out of Mill Creek until the road to the area was completed about 1937.

A "single girl" manned the lookout from 1943-1950. In 1953 the wife of a lookout man was blown off the 30-foot crow brace while hooking up an anemonmeter wire. She received only a few broken bones.

This lookout was replaced in 1963 with another 40-foot tower constructed of treated timber. The new look-out is situated where a chair lift from the 49 North Ski Area unloads.

James R. Elms is in the infrared remote sensing operation, Northern Region, Fire Operations Branch, Division of Fire Management. Drawings are by Thomas C. Ruel, Northern Region, Fire Operatoins Branch, Division of Fire Management.

Blue Mountain Lookout Tower

The WPA built this 73-foot steel tower in 1935. It had no guy wires and was intended to sway with the wind. The house below served as quarters for the lookout who did not live in the tower itself. This tower served as a central communication point for the Kootenai National Forest.

Costs $10

Foolproof Timer Measures Rate Of Fire Spread

E.C. Little

The Canadian Forest Fire Research Institute recently developed a functionally foolproof rate-of-fire spread timer; it costs about $10 to make.

The rate of fire spread is easily measured at the rear and sides of a prescribed burn because you can see them. As the fire develops, however, smoke obscures the fire front and the markers within this burning area. This makes accurate fire spread measurements nearly impossible.

To measure the rate of frontal fire advance, researchers have buried various fire-triggered timing devices beneath the soil at preselected locations. These timers are designed to start operating when the fire front reaches its location. Two main types of timers have been used: a battery-operated clock and a heat-sensitive device that starts an electronic counter. Often, however, these timers fail to start.

Inexpensive, Reliable

The basic principles of these devices were incorporated by the staff at the Canadian Forest Fire Research Institute to make the simple, inexpensive and reliable rate-of-fire spread timer. The prototype, built by the author at a material cost of $10, proved to be functionally foolproof.

Here are the steps for constructing and using the timer.

E. C. Little is a research technician for the Forest Fire Research Institute, Canadian Forestry Service, Ottawa, Ontario, Canada.

Construction (including parts)

1. Using ½ in plywood, build a timer box; outside dimensions should be about 7¼ x 3¼ x 5 in; hinge one side (see figs. 2 & 3).

2. Bend one end of a ⅜ x 16 in copper pipe into a smooth curve as shown, (diagram) to prevent debris entering pipe when box is in place under forest floor, and attach pipe to the box (see figs.).

3. Cut clock hands short enough to clear the inner sides of the timber box.

4. Insulate one end of the clock battery and then connect to the two-wire tilt-type mercury switch.

5. Attach switch to heavy metal strip (figs. 2 and 3).

6. Place clock in box and shim firmly in place.

7. Hang one end of metal strip on ½ in ring.

8. Attach a length of polished household string to the other end of metal strip.

9. Thread the string up through the top of the timer box, through the copper pipe and tie to a securing wire you've attached to the outside of the box. About 10 inches of exposed string is enough to allow the flames to burn the line.

10. Test the operation of the timer.

A C-cell battery will operate the clock for months. No. 12 gauge galvanized wire can be used to clip shut the hinged front of the box. If the timer is to be buried in excessively wet sites, a polyethylene bag can be used to prevent water seepage.

Tests were made using monofilament fishline instead of string. The monofilament melted and released the mechanism when only one tenth the amount of heat was applied as compared to string, but it proved difficult to knot.

Using the Timers

1. At the site prior to the burn, check all clocks for stop/go action by securing and releasing the string.

2. Set the hands at 12 o'clock.

3. Number the timer boxes, record their predetermined locations in the selected area, and bury deep enough to allow 1-inch covering of mineral soil.

4. Replace surface fuels to provide continuity between the disturbed and undisturbed area below the string.

5. The timer boxes may be put in place several days before the fire is lit, but check the strings immediately before lighting the fire in case they have been broken by animals or falling branches.

6. When the fire is lit, start a master clock, which will act as your time reference.

7. After the burning has been completed, dig up the timers and record their time and location. The time the fire front reached each clock location is found by subtracting the timer clock reading from the master clock reading. For example, if the master clock reads 1700 hours and the timer clock reads 1500 hours, the fire must have passed the timer 2 hours after lightup.

Obtaining Parts

Although most parts of the device are readily available, or can be easily made in a workshop, the clocks and switches must be purchased. The clocks, Tokei brand, sweep-second style, C-battery-operated clock movements complete with

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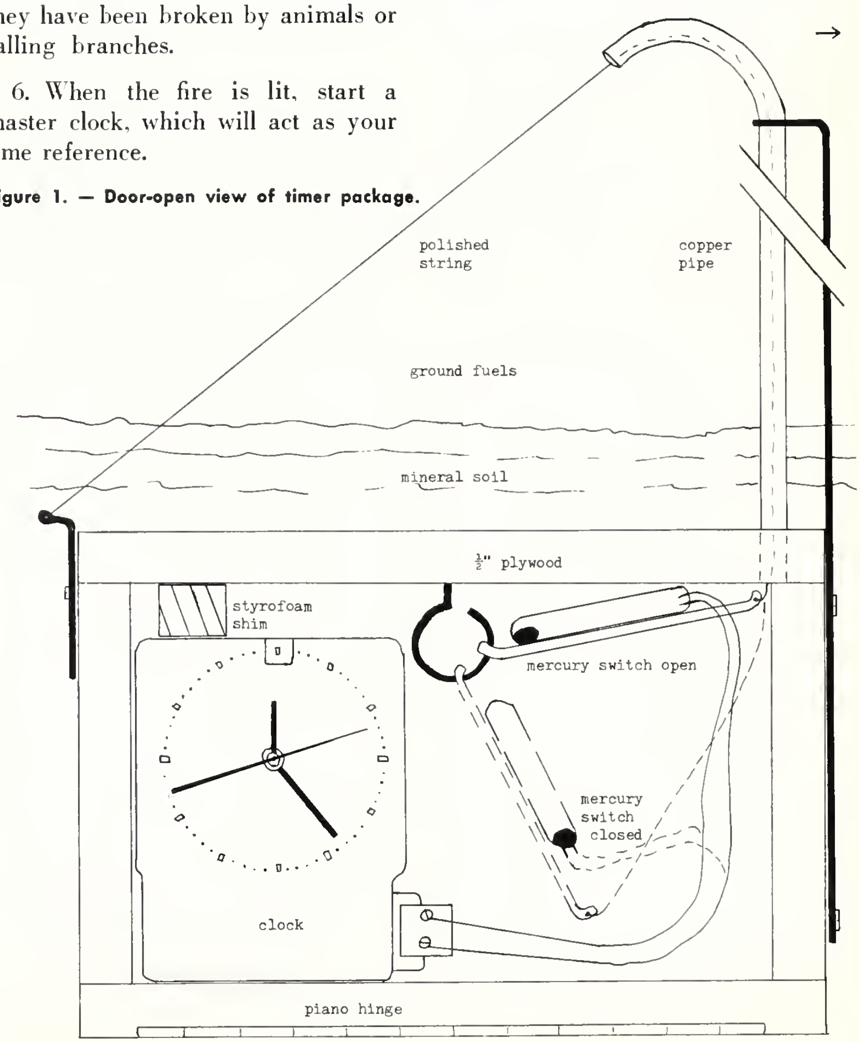
Figure 1. — Door-open view of timer package.



"Crazy Beaver Bomber" Not So Crazy After All

Ed Hegar

Now the county rangers say "Look, here comes that Crazy Beaver Bomber!" Crazy it might be, but when the State Forester says "I think we've finally got something for those mountain fellers," I don't mind.

After patroling wildfires for several years using a DeHavilland U6A Beaver as a patrol-spotter plane in western North Carolina and getting madder with each flight because I didn't have at least a gallon of water on board with which I could help the ground personnel, I got *frustrated!* Today I have 200 gallons of water on board.

In the winter of '71, I received approval to design a tank for the U6A. I designed and installed a "slip in or out" 150-gallon container using doors on both sides of the tank which meant I had to fly with the cargo doors removed. Discharge doors on the container were double-hinged and opened inward into the container. Water pressure kept the doors closed, but because of an unsatisfactory seal, leakage was approximately 1 gallon per minute. On loads taken to a fire approximately 125 gallons were delivered. Cost of this prototype tank was less than $100.

System Passes Test

During the spring fire season of 1972, this system was used on approximately 18 fires, and post-fire season evaluation showed that it had considerable value for fire control. We also concluded that a center-line discharge (not both sides) would be more effective. Lack of fire activity during the fall fire season prevented evaluation of an enlarged (175 gallon) version of the original container.

After our fall fire season, design and construction was begun on a new container at our Kingston, North Carolina facility. This container discharges through the camera opening in the belly of a U6A Beaver. The opening was enlarged and squared — the only structural modification required on the aircraft itself. Material costs were approximately $375.00. The container itself is a somewhat square leaning barrel (see photo). The full capacity of approximately 200 gallons empties through the belly opening in 3 to 3½ seconds. On flat terrain and in light wind conditions, the drop pattern is about 25 feet wide and 200 feet long. Drop speed (IAS) is being held to 80 knots indicated.

Weighs 5,600 lbs. Loaded

Since the maximun gross weight of the U6A is 5,100 lbs. we are limiting our fuel to the two forward tanks (70 gallons). With only a

Ed Hegar is a patrol pilot, North Carolina Forest Service.

hands for seconds, minutes, and hours are available from General Time of Canada, Box 239, Peterborough, Ontario, K9J 6Z1, Canada. The mercury switches, Cat No. TM16K054, ⅞" leads, 3A, 125V, are available from Herbach and Rademan, Inc., 401 East Erie Ave., Philedalphia, Pa. 19134, USA.1-150.

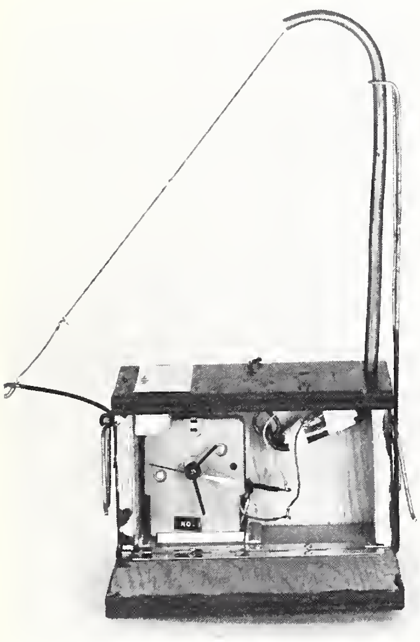


Figure 2. — Tight string; clock stopped.

Figure 3. — Slack (burned) string; clock operating.

pilot and 200 gallons of water the gross weight is about 5,600 lbs. Aircraft performance is affected only in rate of climb. Take-off distance also varies with the runway, paved or turf.

Center of gravity is still within limits, and only a small amount of nosedown trim is needed during take-off. As soon as climb flaps are set, the trim moves toward neutral. Trim for cruise at 28 MP and 1,800 r/m is near 0. Normal cruise airspeed is easier to maintain using just a few degrees of flaps.

Response of the aircraft during and immediately after discharge is a slight nose-down caused by the drop door acting as an auxiliary elevator. Little effort is required of the pilot to overcome this effect. Compared to the S2 Snow Tanker, little rise is caused by the release.

The construction features of the U6A limit the use of retardant agents to the non-corrosive types. Only plain water is currently being used by the NCFS. Gelguard was considered, but the increased time that it would take for the thickened agent to be discharged would increase the length of the drop and reduce its total effectiveness. A wetting agent was tried, but it seemed that the evaporation increased, thereby reducing the total amount of water reaching the ground. The lack of forest canopy does not necessitate the additional weight factor of the retardant in my area as in the eastern North Carolina regions.

2 to 5 Minutes To Load

Loading time through the 2-inch filler valve varies from 2 to 5 minutes.

200-gallon, removable water tank mounted on U6A Beaver Aircraft, North Carolina Forest Service.

Drop techniques vary greatly and are influenced mainly by terrain features, and also to a lesser extent by wind and weather conditions. Drop effectiveness varies greatly by these same conditions as well as by pilot's use of "Tennessee Aim." Rangers who have had drops made for them on fires describe the effectiveness anywhere from "increased the RH factor," "dew-drop," to "flash-flood."

Because the capacity of the tank is only 200 gallons and it can be filled only with plain water, it is not very effective in controlling a going forest fire. However, the tank is used for initial attack, not support. Two-hundred gallons will buy time for the ground personnel to contain a loose fire, while additional ground support men and equipment are mobilized. Since most of our fires are of the upslope type with small, fast running heads, the drop pattern of the Beaver Bomber is usually sufficient to at least cool down the

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Model-70, from p. 7

charge connections; and left and rear draft connections. The two electric rewind hose reels are mounted in side compartments. Each reel contains 250 feet of $3/4$-inch high-pressure hose. In addition, $1\frac{1}{2}$ inch and 1 inch high pressure cotton jacket hose may be carried in an accordian lay o ntop of the 600-gallon water tank.

Rapid Access Control Panel

The unit's control panel is mounted in a compartment on the left side immediately behind the cab of the truck. This permits the tank truck operator to have rapid access to the pump controls and to the truck itself.

All tools are stored in enclosed compartments. The truck is equipped with red lights, electronic siren, and public address system.

The Southwestern Region purchased the trucks and contracted with an equipment company to assemble and mount the pump, tank, compartments, etc.

Average cost per unit was (including initial servicing): Truck \$5,700, pumper tanker unit \$7,300, for a total of \$13,000.

Unit Less Expensive

"This is considerably less expensive than any comparable unit with which we are familiar," the Region reports.

These Model-70 tankers are a joint product of the Divisions of Engineering and of Fire and Air Management. The original design was by Ray Hemphill, now an engineer with the Pacific Northwest Region, Forest Service.

Domesticated Bobcat...

Something New in Slash Disposal

Dale Getz

The disposal of logging slash under a residual stand of timber is a continual problem for the fuel manager. Hand piling has been the most traditional method used to pile slash for burning. However, rising costs of labor coupled with demands for a better, more complete job have resulted in a search for more efficient methods of accomplishing this task.

The Forest Service and the Clearwater-Potlatch Timber Protective Association in Northern Idaho have used a machine which they offer here as a partial solution to the problem.

Paul Palmer of Kamiah, Idaho, introduced the use of the Melroe Bobcat machine to pile slash for burning. This machine, a product of the Clark Equipment Company of North Dakota, was originally designed for use in the gathering and loading of materials used in the production of pulp. Since that time, however, it has been used on jobs ranging from post hole digging to snow removal. Mr. Palmer recognized its potential for slash disposal and has been seeking to introduce it and similar machines of larger design.

Dale Getz is forestry technician, Palouse Ranger District, St. Joe NF, Idaho.

Bobcats Pile Brush

The Bobcats piled brush on three carefully selected timber sale areas. Slash in the areas resulted from a timber harvest of 25,000 board feet/acre of mature grand fir and Douglas fir trees. Slopes varied from 0 to 55 percent with ridgetops generally in the 0 to 20 percent range. Brush was

Bobcat pile ready to burn. This pile represents about 20 minutes' work for one machine.

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head until ground people can reach it. Once the head movement is slowed or stopped, flank drops can be made. I currently estimate that if three drops don't help, conditions require much more manpower and equipment. The acceptable time lapse between the first report and the first drop is no more than 1 hour.

Initial Attack Is Lost At Ridge-Top

If the head has already reached the ridge-top, initial attack is lost. Steepness of the fire terrain will dictate the type of drops, whether they be parallel flank or across the flank (ladder effect), or along the contour of the hill. We are still working on guidelines for the most effective drops.

The modified Beaver also can be used as a scout or patrol when not needed as an aerial tanker, and it can be converted to passenger/cargo use in approximately 1 hour, thereby making the U6A Beaver a 4-way piece of equipment.

The Beaver Bomber also reduces greatly the use of that *other* great piece of fire control equipment, the fire-rake.

piled along primary and secondary ridges, thus providing effective breaks in fuel continuity from 1 to 2 chains wide.

The piles were 6 feet or more high, compact, and dirt free. Waterproof paper was used to cover the piles so they wouldn't get wet. The piles were burned in the fall and, as hoped, burned fast and clean with little or no damage to the remaining timber.

Zero to 15 percent slopes permitted optimum performance of the machine, and on slopes over 20 percent, it became much less effective.

Bobcat pile: Burned under wet conditions.

Cost Is Low

Cost per acre depended upon the volume of slash in the area, the number of trees and stumps to work around, the size of material to be handled, and the percent of slope. An average cost was estimated by the contractor to be $50 per acre. This particular job cost $75 per acre, which when compared to the $150 per acre cost of hand piling and the thoroughness of work, represents a considerable saving.

Although the machine was equipped with four-wheel drive, wet soil conditions were a barrier to its top performance. Crawler type tracks are available for the machine and would help considerably.

Future use of the Bobcat will probably include thinning areas where fuel breaks up to 70 feet are required. In these areas, the Bobcat's speed and maneuverability will be used to the fullest.

A 31-Day Battery-Operated Recording Weather Station

The battery-operated recording weather station measures and records wet bulb temperature, dry bulb temperature, wind speed, and rainfall for 31-days. Assembly procedures and cost of supplies and components are discussed.

New Research Note—185 is available from Pacific Northwest Forest and Range Experiment Station, USDA Forest Service, P. O. Box 3141, Portland, Ore. 97208.

NFPA-295

Revised Publication Aids Fire Departments In Rural Communities

"Wildfire Control by Volunteer Fire Departments 1973" (NFPA-295) is the new title for the revised edition of this excellent publication. It was titled "Forest, Grass and Brush Fire Control 1965."

The current text has been developed to help the thousands of small community fire organizations which exist in the rural and forested areas of North America. Many of these communities can be exposed to the dangers of a large fire involving many acres of forest, grass, or brush. In preparing for such emergencies, the organizations and individuals having the responsibility for fire control should be informed of the most useful fire control equipment, training, and operations.

The recommendations in this guide were prepared by the National Fire Protection Association (NFPA) Forest Committee. It can be purchased for $2.00 by ordering from National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

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New Guidebook Describes Fire Prevention for Buildings in Forest Areas

Remove vegetative material within a radius of at least 100 feet from buildings in forested areas.

Bury or remove waste materials that may contribute to outdoor fires.

This and other practical guidance on prevention of fires in structures in forest areas where water supply and fire department assistance are limited appears in the 1972 edition of the National Fire Protection Association (NFPA) guide *Recommended Good Practice for Homes and Camps in Forest Areas* (NFPA No. 224).

Major sections in this 32-page text for home and cottage owners are on area fire protection, structural standards, electrical equipment, heating and cooking equipment, general fire protection, outdoor fire protection, and campers' rules.

Developed by the NFPA Forest Committee, this widely used guide was adopted in its present form at the 1972 NFPA Annual Meeting.

Copies of the 1972 edition of *Recommended Good Practice for Homes and Camps in Forest Areas* (NFPA No. 224), 32-pages, $1, are available from the NFPA Publications Service Department, 60 Batterymarch St., Boston, Mass. 02110.

Fire-Weather Observers' Handbook Available

By William C. Fischer and Charles E. Hardy, this new handbook is 152 pages and is illustrated. It is available from Intermountain Forest and Range Experiment Station, Ogden, Utah 84401.

Fire-weather measurements and instruments used are described. Specifications for the location and layout of a fire-weather station are given along with installation instructions for suggested equipment. Step-by-step instrument operation and maintenance instructions are provided. Emphasis is on minimizing the major sources of error commonly associated with weather measurement.